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UNITED STATES DEPARTMENT OF AGRICULTURE  
Agricultural Research Administration  
Bureau of Plant Industry, Soils,  
and Agricultural Engineering.

H. F. & S. Office Report No. 193

✓ SHIPPING TESTS WITH WASHINGTON NAVEL AND VALENCIA ORANGES UNDER  
HALF-STAGE AND FULL-BUNKER REFRIGERATION FROM SOUTHERN CALIFORNIA  
MAY AND JUNE 1948. ✓

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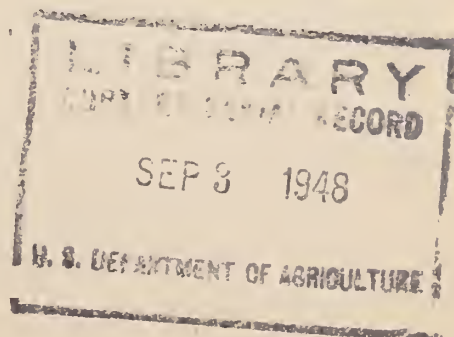
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California Fruit Growers Exchange

Pomona, California  
July 20, 1948.



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U.S. Department of Agriculture

California Fruit Growers Exchange

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Grateful acknowledgment is made of the fine cooperation of the Pacific Fruit Express Company and the Santa Fe Refrigerator Department, especially to Pete Holst and Gordon Gould (PFE) and C. A. Mulvihill and Sid Myers (SFRD).

SHIPPING TESTS WITH WASHINGTON NAVAL AND VALENCIA ORANGES UNDER  
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INTRODUCTION

The present report deals with a study similar to that presented in HT&S Office Report No. 187, March 1948, and handled in the same manner, since the main purpose of both studies was the same.

Report No. 187 presents a description of the factors which hindered the use of half-stage refrigeration and suggests the need for additional information concerning this type of refrigeration in order to clarify the situation and re-establish a satisfactory basis for its recommendation. Other introductory statements of the report need not be repeated here. It should be sufficient to say that the aim of that study was to obtain further information on half-stage refrigeration for the transportation of California Washington Navel oranges during the winter, and that the aim of the present study differed only in the shifting of interest to late spring shipments of Navel and Valencia oranges. The latter study consisted of 14 shipping tests to New York from Southern California comparing half-stage and full-bunker refrigeration, carrying "warm" fruit in the 561-box load. The various refrigeration services on which the half-stage icing rule was superimposed will be given in the description of individual tests.

PLAN OF TESTS

1. The shipping tests were designed along the line of the greatest permissible simplicity. Each consisted of two cars loaded at the same packing house on the same day and billed to the same destination, New York. One of the pair of cars was billed half-stage and the other full-bunker refrigeration. Otherwise they were as nearly identical as possible with respect to type of car and commercial loads. If they were fan cars the fans in both cars were sealed "on".
2. Each car carried a Ryan recording thermometer inside a box of oranges in the center line at quarterlength, middle layer position. Also, one car of each test carried a Ryan thermometer attached to a beam underneath the floor near the doorway for recording outside temperatures.
3. Test boxes of comparable fruit were placed in each car adjacent to the boxes containing the Ryan thermometers (i.e. MQ-CL). The test boxes were weighed at loading point and on arrival at destination. After being weighed on arrival the fruit was inspected but was not held for a second inspection.
4. The Ryan thermometer temperatures were supplemented by fruit temperatures at the doorway obtained manually at Belen and El Paso, and similarly again at destination, with the addition of quarterlength and bunker position temperatures.

## RESULTS

### 1. Outside temperatures encountered in transit.

These half-stage refrigeration tests were planned to be run during the spring, or transition between the strictly winter and the hot summer seasons. However, the reports of temperature along the shipping routes during March indicated weather too cool to justify starting the tests. Through April also the weather continued generally cooler than was deemed desirable for best results. By the time the weather along the routes became more favorable the harvest of Navel oranges was almost completed. Further delay was caused by the slow movement of Valencias in early May. It therefore happened that the tests were started not only considerably later than originally planned but also after temperatures en route were rather nearer those expected of summer than of spring.

The outside temperatures encountered by each test shipment and the temperatures at the middle quarterlength taken from Ryan charts, are shown in the graphs of figures 2 to 15, inclusive. Six tests were routed via the Southern Pacific and eight via the Santa Fe. In figure 1 are presented separately the average daily temperatures which the tests encountered along these two routes. The figure includes graphs of average daily maxima, average daily minima, and the average daily means. Unfortunately there are not sufficient data available on transit temperatures from former tests during May and June to indicate whether or not the temperatures encountered by the present series should be considered typical for the season.

### 2. Ice meltage en route to Belen and El Paso.

In table 1 are presented some data on ice meltage recorded for the tests in relation to loading temperature, icing service and route. Further data on the ice situation is given in the section, "Notes on individual tests"

### 3. Notes on individual tests.

Test 13. Washington Navels. NY via S.Fe. Gaviland Citrus, Arlington. Loaded 5/12 (loading Temp. 76°). Arr. Belen 5/15. Unloaded NY 5/23. Non-fan cars. Dry cars loaded. PC 8 hrs. by C. II by C. FB car Ri, Belen and Argentine. HS car standard refrigeration. Doorway Temp. and ice in bunkers:

Belen: FB car 51°; each bunker 4/8 full. HS car 51°; each 6/8 full (i.e. 6/8 of 1/2 bunker, or about 4900 lbs. of ice remaining).

New York: FB car 49°; each 1/3 full. HS car 47°; each 7/8 full.

Fruit loading at 76°F. and into dry cars allowed rise in temperature of about 3° to time of precooling and icing. Afterwards the fall in temperature was too gradual, requiring 7 days to reach 50° (See figure 2).

Test 14. Washington Navels. NY via SP. Brown Estate, Highgrove. Loaded 5/13 (loading Temp. 78°). Arr. El Paso 5/16. Unloaded NY 5/23. Fan cars, fans sealed "on" but arrived NY fans sealed "off". Presumably this change was made at El Paso. Both FB and HS cars PI by C, Repl. Std. Ker. Doorway temperatures and ice in bunkers:

El Paso: FB 47°; each 7/8 full. HS 48°; each 7/8 full.  
New York: FB 45°; each 7/8 full. HS 45°; each 7/8 full.

The temperature fall in both cars was rapid, reaching 50° the second day after loading, due to the excellent refrigeration service and operation of fans. The slower rate of cooling after El Paso was probably much the effect of non-operative fans. (See figure 3).

Test 15. Washington Navel. NY via S.Fe. McDermont Fruit Co., Riverside. Loaded 5/13 (loading Temps. FB 70°; HS 74°). Arr. Belen 5/16. Unloaded NY 5/23. Fan cars, fans "on". Both cars PI by C, Repl, 2 RI at Belen and Blue Island. Doorway temperatures and ice in bunkers:

Belen: FB 51°; each 4/8 full. HS 51°; each 2/8 full.  
New York: FB 45°; each 2/3 full. HS 47°; each 1/16 full.

A satisfactory rapid fall of temperature in both cars, although the FB car reached 50° about 20 hours before the HS car which maintained about 6° higher temperature than the FB throughout the trip. However both cars showed good refrigeration. (Fig. 4).

Test 16. Washington Navel. NY via S.Fe. Redlands Coop. Loaded 5/14 (loading Temp. 81°). Arr. Belen 5/17; unloaded NY 5/24. Non-fan cars. Dry cars loaded. PG 8 hrs. by C. Ii, Std. Ref. Doorway Temp. and ice in bunkers:

Belen: FB 59°; each 7/8 full. HS 54°; each 6/8 full.  
New York: FB 47°; each 6/8 full. HS 47°; each 6/8 full.

Besides loading the warmest fruit of this series, the cars were dry and non-fan equipped. The temperatures did not reach 50° until the sixth and seventh days after loading, the HS car being the more tardy. The fruit in both cars was reported in good condition on arrival but the refrigeration rule used, without the benefit of a preiced car, should be considered as potentially dangerous. The HS car was unloaded about 24 hours before the FB car. The test boxes of the former were held on the dock for inspection at the same time as those of the latter. This holding of the HS test boxes accounts for the rapid rise in temperature shown in figure 5.

Test 17. Valencias. NY via SP. Placentia Orange Growers, Fullerton. Loaded 5/21 (loading Temp. 67°). Arr. El Paso 5/24; unloaded NY 6/1. Fan cars, fans "on". Ii by S, 2 Ri at El Paso and Blue Island. Doorway temperatures and ice in bunkers:

El Paso: FB 52°; each 2/8 full. HS 60°; each 1/8 full.  
New York: FB 42°; each 3/8 full. HS 46°; each 2/8 full.

This test encountered some very hot weather and the HS car made a relatively poor refrigeration showing. It was 5 days in reaching 50°, or about 54 hours longer than the FB car in doing so. Something happened to the stages in the HS car for it appears that it received full-bunker icing at Blue Island and it arrived in New York with ice at the bottoms of the bunkers (Fig. 6).

Test 18. Valencias. NY via S.Fe. Irvine Valencia Orange. Loaded 5/25 (loading Temp. 63°). Arr. Belen 5/28. Unloaded NY 6/3. Fan cars, fans "on". Ii by S. then FB car 2 Ri at Belen and Blue Island. HS car, Std. Ref. Doorway temperatures and ice in bunkers:

Belen: FB 58°; each 3/8 full. HS 58°; each 5/8 full.  
New York: FB 45°; each 4/8 full. HS 45°; each 7/8 full.

Both cars showed excellent refrigeration, reaching 50° by the evening of the second day after loading. (Fig. 7).

Test 19. Valencias. NY via SP. Tustin Hills Citrus, Tustin. Loaded 5/26 (loading Temp. 59°). Arr. El Paso 5/30. Unloaded NY 6/6. Fan cars, fans "on". Ii by S, then FB car 2 Ri at El Paso and Blue Island. HS car Std. Ref. Doorway temperatures and ice in bunkers:

Belen: FB 49°; each 4/8 full. HS 48°; each 5/8 full.  
New York: FB 47°; each 4/8 full. HS 43°; each 7/8 full.

Both cars showed excellent and almost identical refrigeration, reaching 50° by noon of the third day after loading. (Fig. 8).

Test 20. Valencias. NY via S.Fe. Placentia Mutual. Loaded 5/26 (loading Temp. 65°). Arr. Belen 5/29. Unloaded NY 6/6. Fan cars, fans "on". PI by C. PC 8 hrs., Repl, 2 Ri, FB at Waynoka and Blue Island; HS at Belen and Blue Island. Doorway temperatures and ice in bunkers:

Belen: FB 48°; each 6/8 full. HS 50°; each 2/8 full.  
New York: FB 46°; each 3/8 full. HS 49°; 20 lbs. and 5 lbs.

Refrigeration results practically same as in test 19. (See Fig. 9).

Test 21. Valencias. NY via SP. Villa Park Orchards. Loaded 5/27. (Loading Temp. 70°). Arr. El Paso 5/30. Unloaded NY 6/6. Fan cars, fans "on". Ii by S. then FB car 2 Ri at El Paso and Silvis: HS car, Std. Ref. Doorway temperatures and ice in bunkers:

El Paso: FB 49°; each 2/8 full. HS 46°; each 5/8 full.  
New York: FB 43°; each 3/8 full. HS 44°; each 7/8 full.

Refrigeration results even somewhat better than in tests 19 and 20. (See figure 10).

Test 22. Valencias. NY via S.Fe. Frances Citrus. Loaded 6/1 (loading Temp. 72°). Arr. Belen 6/4. Unloaded NY 6/13. Fan cars, fans "on". PI by C. PC 8 hrs, Repl. One Ri at Belen, but HS car later was ordered Ri again at Blue Island. Doorway temperatures and ice in bunkers:

Belen: FB 56°; each 4/8 full. HS 56°; each 5/8 full.  
New York: FB 49°; each 2/8 full. HS 50°; each 1/8 full.  
(See figure 11).

Test 23. Valencias. NY via S.Fe. Placentia Mutual. Loaded 6/2 (loading Temp. 63°). Arr. Belen 6/6. Unloaded NY 6/14. Fan cars, fans "on". PI by C. PC 8 hrs, Repl, 2 RI at Belen and Blue Island. Doorway temperatures and ice in bunkers:

Belen: FB 46°; each 5/8 full. HS 52°; each 3/8 full.  
New York: FB 46°; each 3/8 full. HS 46°; each 3/8 full.

Both cars showed excellent and almost identical refrigeration, reaching 50° by noon of the third day after loading. A derailment near Vaughn, N.M. delayed the test about 20 hours and on arrival in NY the stages of the HS car were reported to have been so damaged that in both bunkers the ice had spilled through to the bottom (See figure 12).

Test 24. Valencias. NY via SP. Garden Grove Citrus. Loaded 6/3 (loading Temp. 67°). Arr. El Paso 6/7. Unloaded NY 6/15. Fan cars, fans "on". PI by C, PC 8 hrs, Repl. then FB car 2 RI Dalhart and Silvis. HS car Std. Ref. Doorway temperatures and ice in bunkers:

El Paso: FB 44°; each 7/8 full. HS 44°; each 7/8 full.  
New York: FB 46°; one 1/2, other 3/8 full. HS 42°; each 8/8 full.

Both cars showed excellent and almost identical refrigeration, reaching 50° the afternoon of the third day after loading. (See Fig. 13). However, the ice in the bunkers was down only 1600 lbs. at El Paso, a fact which indicates strongly that the FB car was reiced by mistake at Tucson or Yuma.

Test 25. Valencias. NY via SP. Placentia Orange, Fullerton. Loaded 6/3 (loading Temp. 69°). Arr. El Paso 6/6. Unloaded NY 6/14. Fan cars, fans "on". II by S, then FB car 2 RI at El Paso and Silvis. HS car Std. Ref. Doorway temperatures and ice in bunkers:

El Paso: FB 51°; each 2/8 full. HS 46°; each 6/8 full.  
New York: FB 47°; each 2/8 full. HS 47°; each 8/8 full.

Refrigeration results were practically the same as in test 24, the temperature reaching 50° by about midnight of the second day after loading. (Fig. 14).

Test 26. Valencias. NY via S.Fe. El Ranchita Citrus, Rivera. Loaded 6/4 (loading Temp. 70°). Arr. Belen 6/7. Unloaded NY 6/15. Fan cars, fans "on". PI by C, PC 8 hrs, Repl, then FB car 2 RI at Waynoka and Blue Island. HS car, Std. Ref. Doorway temperatures and ice in bunkers:

Belen: FB 56°; each 6/8 full. HS 56°; each 6/8 full.  
New York: FB 47°; each 4/8 full. HS 47°; each 7/8 full.

Both cars gave adequate refrigeration but the fall in temperature was slow. This gradual fall of temperature combined with the fact that the HS car was about 4° warmer than the FB car caused the former not to reach 50° until noon of the fifth day after loading, or two days later than the FB car. (Fig. 15). Here, as in test 24, there is some indication that the FB car was reiced by mistake west of Belen.

#### 4. Comparative temperatures.

The relative refrigeration obtained from full-bunker and half-stage iced cars has received comments in the preceding section, "Notes on individual tests", and is shown graphically in figures 2 to 15, inclusive.

There were seven tests (Nos. 13, 18, 19, 21, 24, 25, and 26) in which pairs of test cars were given the same preliminary refrigeration procedures (e.g. Dry car-PC-II; II by S; or PI by C-PC-Repl), but afterwards the full-bunker iced cars were billed "two reicings in transit" and the half-stage cars, "standard refrigeration". The aim of this set of comparisons was to learn whether or not half-stage icing with standard refrigeration would equal the performance of full-bunker icing with two reicings in transit. If so, it would be a preferable service on two counts: one that whenever unpreventable serious delays might occur in transit the standard refrigeration service would be a valuable additional safeguard; the other, that the charges are generally somewhat less for half-stage icing with standard refrigeration than for full-bunker icing with two reicings in transit. The records show that the transit temperatures of each of the seven pairs of cars were practically identical. On the matter of "additional safeguard" there were no data, as all these cars moved to destination without delays. There was an unimportant exception in test 26 where, for some obscure reason, the HS car averaged about 4° warmer than the FB car.

In three tests (Nos. 17, 22, and 23) something happened to the stages of the HS car, causing a change from half-stage to full-bunker icing service en route in one, and a spilling of the ice to the bottom of the bunkers in the others. The records are therefore difficult to interpret, but the cars must be considered as having arrived at destination in the status of full-bunker icers.

Taking this series of fourteen tests as a whole, it is not considered that any temperature differences in transit between full-bunker and half-stage iced cars were of commercial significance. This opinion is based partly on the temperature records but more on observations made on fruit condition at destination.

#### 5. Weight loss in transit.

The losses in weight of test fruit in transit are presented in table 2. However, the data seem to give no evidence of significant differences between full-bunker and half-stage icing services. The general average loss was about one percent. The loading temperature of the fruit appears to be the most influential factor in weight loss in transit. Test boxes in cars having fruit loaded at 75 degrees or above showed an average loss of 1.87 percent, and those in cars loading at 70 degrees or lower, an average of 0.67 percent.

#### 6. Condition of fruit in test boxes and commercial loads.

Table 3 presents the record of fruit condition on arrival at New York. The first four tests were with Navel oranges representing the very

last of the harvest. Moreover, the fruit of all these eight cars was loaded at temperatures above 70 degrees; two cars above 80. So it is not surprising that some more than normal shrinkage was found in this fruit. Also under the circumstances decay seemed unexpectedly low. In the test boxes the average decay was about 1/2 and 3/4 percent for the full-bunker and half-stage services, respectively. There were only slight differences in appearance of the fruit from the two services, the full-bunker icing being slightly favored in two tests. But for the ten tests with Valencia oranges no differences were recorded in any category as related to comparison of full-bunker and half-stage refrigeration.

### CONCLUSIONS

The purpose of the series of shipping tests here reported is quite similar to that reported in H.T. & S. Office Report No. 187, March 1948. It differs only in being a study of half-stage refrigeration and non-precooled heavy orange loads during spring instead of winter.

The results of the present parallel tests of half-stage and full-bunker icing seem to justify the following statements:

1. The outside temperatures encountered by the tests in transit seem to have been as high or higher than what might be expected as typical during spring months.
2. The cooling attained by half-stage icing in transit was generally somewhat less than that of full-bunker icing but the differences were apparently of no commercial importance.
3. In nine of the fourteen tests the differences in average transit temperatures between half-stage and full-bunker cars was less than two degrees. The greatest average difference was six degree, shown in one test. In three of the tests the average differences in temperature were somewhat in favor of half-stage icing.
4. When the prevailing weather conditions are presumed to call for full-bunker icing with two reicings in transit, half-stage icing with standard refrigeration may be substituted safely at usually slightly less cost and, in the event of delays in transit, probably with considerable advantage in refrigeration obtained.
5. When prevailing weather conditions are as above (Par.4) and fruit temperatures are likely to be 75 degrees or more, the loading of dry cars is not recommended.
6. For distant destinations half-stage refrigeration with only one icing in transit is not recommended for non-precooled fruit.
7. Under the conditions of the tests, the amount of ice required at the first reicing station (either Belen or El Paso) varied from 1600 to 10,200 pounds, depending upon the loading temperatures of the fruit, the

icing service, and the outside temperatures. The average amount of ice received at the first reicing by the seventeen test cars not under standard refrigeration was 5300 pounds.

8. No significant differences in weight loss in transit between full-bunker and half-stage refrigeration were noted.

9. No significant differences were recorded between full-bunker and half-stage refrigeration, for decay or general appearance of the fruit, with the possible exception of two Navel orange tests where a slight difference in firmness was noted in favor of full-bunker refrigeration.

10. The results of this series of shipping tests indicate strongly that with judicious choice of basic icing service half-stage refrigeration may be used safely for non-precooled oranges during the **spring months**.

N.B. The supplementary page immediately following gives some comparisons of half-stage and full-bunker refrigeration charges.

# Some Comparisons of Half-Stage and Full-Bunker Refrigeration Charges

(Adapted from CFGE Traffic Department Circular No. 132 - January 1, 1947)  
 (and CFGE Traffic Department Circular No. 130, Sup. 2 - March 8, 1948, )  
 (including increases effective May 6, 1948. )

Rule		Omaha	Memphis	Buffalo	Montreal	Hartford
		Fort Worth Kansas City Sioux City	Chicago Minneapolis St. Louis	Cleveland Pittsburgh Toronto	New York Philadelphia Richmond	Boston Portland, Me. Providence
Std. Ref.	FB <sup>1,2/</sup>	\$88.55	\$97.41	\$109.43	\$120.18	\$126.50
	HS <sup>1/</sup>	69.30	75.90	85.25	93.50	98.45
Reiced, Std. Ref.	FB <sup>2/</sup>	94.88	103.73	115.75	126.50	132.83
	HS	74.25	90.85	90.20	98.45	103.40
le 249, one RI in transit	FB	63.25	64.52	67.05	68.31	69.58
	HS	49.50	50.05	52.25	53.35	54.45
le 249, two RI in transit	FB	84.76	88.55	92.35	93.61	94.88
	HS	66.00	69.30	72.05	73.15	74.25
le 239, PI, Repl. DNR	FB	46.18	46.81	48.71	49.97	51.24
	HS	35.75	36.30	37.95	39.05	39.60
le 239, PI, Repl, 1 RI in transit	FB	69.58	70.84	73.37	74.64	75.90
	HS	54.45	55.00	57.20	58.30	59.40
le 239, PI, Repl, 2 RI in transit	FB	90.75	94.88	98.67	99.94	101.20
	HS	70.95	74.25	77.00	78.10	79.20
le 245, Dry ear, PC, Ii by C, 2 RI.	FB	88.55	91.72	95.51	96.78	98.04
	HS	69.30	71.50	74.25	75.35	76.45
le 245, PI, PC, Repl by , 2 RI in Tr.	FB	94.88	101.20	105.00	106.26	107.53
	HS	74.25	79.20	81.95	83.05	83.60

<sup>1/</sup> FB - full-bunker; HS - half-stage icing.

<sup>2/</sup> On request carrier will precool without additional charge if precooling space is available.

Table 1. Ice Meltage

Test No.	Loading Temp. °F.	Service		Ice melted <sup>1/</sup> Lbs.
<u>To Belen - Santa Fe</u>				
13	76	FB	PC 8, Ii, 2 Ri.	5400
		HS	" " " and Std. Ref.	No record available at present for tests under Std. Ref.
15	70	FB	PI, Repl, 2 Ri.	5800
		HS	ditto	4800
16	81	FB	PC 8, Ii, Std. Ref.	----
		HS	ditto	----
18	63	FB	Ii by S, 2 Ri.	6300
		HS	" " " Std. Ref.	----
20	65.5	FB	PI, PC 8, Repl, 2 Ri.	<sup>2/</sup> 2700
		HS	ditto	4500
22	72	FB	PI, PC 8, Repl, 1 Ri.	5400
		HS	ditto except 2 Ri.	2100
23	62.5	FB	PI, PC 8, Repl, 2 Ri.	<del>3</del> 600
		HS	ditto	<del>3</del> 600
26	70	FB	PI, PC 8, Repl, 2 Ri.	<sup>2/</sup> 2700
		HS	" " " " Std. Ref.	----
<u>To El Paso - Southern Pacific</u>				
14	78	FB	PI, Repl, Std. Ref.	----
		HS	ditto	----
17	67	FB	Ii by S, 2 Ri.	9000
	63.5	HS	ditto	6500
19	59	FB	Ii by S, 2 Ri.	6400
		HS	" " " and Std. Ref.	----
21	70	FB	Ii by S, 2 Ri	10,200
		HS	" " " Std. Ref.	----
24	67.5	FB	PI, PC 8, Repl, 2 Ri.	<sup>3/</sup> 1600
		HS	" " " " Std. Ref.	----
25	69.5	FB	Ii by S, 2 Ri.	9700
		HS	" " " Std. Ref.	----

<sup>1/</sup> Ice supplied at first reicing station.<sup>2/</sup> Estimated at Belen; reiced at Waynoka.<sup>3/</sup> Estimated at El Paso; reiced at Dalhart.

Table 2. Loss of Weight of Test Fruit in Transit from Southern California to New York.

Test No., Route, Car No. & Service		Fans	Refrigeration Service		Pack	Days in Tr.	Box No	Loss of Weight	Percent
								Lbs.	
Washington Navel oranges									
13	S.Fe RD 36503	FB	None	Dry car, PC 8 hrs, Ii, 2 RI, Belen & Argentine.	Wrapped	11	C-50	1.4	1.72
	RD 36124	HS	"	" " " 8 " and Std. Ref.	"		C-52	1.3	1.58
14	SP PFE 67192	FB	("On", arr.	PI, Repl, Std. Ref.	"	10	C-54	1.2	1.49
	" 67193	HS	(NY sealed ("off".	" " " "	"		C-56	1.2	1.45
15	S.Fe RD 14954	FB	On	PI, Repl, 2 RI Belen & Blue Island.	"	10	C-58	0.8	1.00
	" 4659	HS	"	" " " "	"		C-60	.7	.87
16	S.Fe RD 31718	FB	None	Dry cars, PC 8 hrs, Ii, Std. Ref.	"	10	C-62	1.5	1.94
	" 34413	HS	"	" " " "	"		C-64	1.8	2.24
Valencia oranges									
17	SP PFE 66704	FB	On	Ii by S, 2 RI, El Paso and Blue Island.	Squeeze	11	C-66	--	--
	" 66705	HS	"	" " " 2 " " "	pack		C-68	--	--
18	S.Fe RD 4278	FB	"	Ii by S, 2 RI, Belen and Blue Island.	Alternate layers wrapped	9	C-70	0.6	.72
	" 15314	HS	"	" " " Std. Ref.			C-72	.5	.61
19	SP PFE 66741	FB	"	Ii by S, 2 RI, El Paso and Blue Island.	Wrapped	11	C-74	.5	.63
	" 66742	HS	"	" " " Std. Ref.	"		C-76	.3	.37
20	S.Fe RD 3782	FB	"	PI, PC 8 hrs, Repl, 2 RI, Waynoka & Blue Is.	Blind	11	C-78	.5	.60
	" 3710	HS	"	" " " 2 " , Belen & Blue Island.	"		C-80	.5	.61
21	SP PFE 66739	FB	"	Ii by S, 2 RI, El Paso and Silvis.	Squeeze	10	C-82	.9	1.07
	" 66740	HS	"	" " " Std. Ref.	pack		C-84	.5	.58

Table 2. (Cont'd)

Test No., Route, Car No. & Service	Fans	Refrigeration Service	Pack	Days in Tr.	Box . Loss of Weight No.	Lbs. Percent	
22 S.Fe RD 15318 FB " 8474 HS	On	Pl, PC 8 hrs, Repl, one RI at Belen. " " 8 " " , 2 RI, Belen & Blue Island.	Blind	12	C-86 C-88	0.3 1.0	.36 1.20
23 S.Fe RD 14853 FB " 15335 HS	" "	Pl, PC 8 hrs, Repl, 2 RI, Belen & Blue Island. " " 8 " " " " "	"	12	C-90 C-92	.8 .8	.98 .96
24 SP PFE 66975 FB " 66780 HS	" "	" " 8 " " " 2 RI, Dalhart and Silvis. " " 8 " " Std. Ref.	"	12	C-94 C-96	.6 .3	.74 .37
25 SP PFE 66781 FB " 66782 HS	" "	Ii by S, 2 RI, El Paso and Silvis. " " " " Std. Ref.	Squeeze pack	11	C-98 C-100	.8 .9	.98 1.12
26 S.Fe RD 7035 FB " 7250 HS	" "	Pl, PC 8 hrs, Repl, 2 RI, Waynoka & Blue Island. " " 8 " " Std. Ref.	Wrapped.	11	C-102 C-104	.7 .6	.81 .69
Average FB cars						1.00	
" " HS						.97	
" " All						.99	

Table 3. Condition of Test Fruit on Arrival at Destination (N.Y.).

Test	Service	Fans	Fruit showing				Remarks
			Decay	Pitting		Wilting	
				No.	%		
			No.	%	No.		
13	<del>FB</del> <del>HS</del>	None "	1 BM 2 BM	.46 .91	4 3	0 1	The two cars practically alike; firm color good, bright (FB slightly brighter), buttons green. Pitting slight, Less than 1 % decay.
14	FB HS	"On" but arr. NY sealed "off" both cars.	1 BM 4 BM	.46 1.82	7 3	2 Sl. 0	FB car slightly firmer, less decay; HS car more soft & flabby fruit, otherwise the 2 cars alike. Fresh, bright, well colored, fairly firm to firm, buttons green. Less than 1 % decay.
15	FB HS	On "	1 Alt 1 BM	.46 .46	0 1 sl	0 0	Practically no difference between the two cars; bright, good color, firm, buttons green to turning. Less than 1 % decay.
16	FB HS	None "	1 BM 0	.46 0	11 16	2 0	Practically no difference between the 2 cars; bright, good color, buttons green to slight wilt; considerable pitting, less than 1 % decay. HS car unloaded 24 hrs. earlier than FB car and held at room temperature.
17	FB HS	On "	0 0	0 0	0 0	0 0	The 2 cars alike; test boxes & commercial loads, firm, fresh, bright, buttons green. Practically no decay.
18	FB HS	On "	0 0	0 0	0 0	0 0	The 2 cars alike; bright, color fairly good to mostly good, firm, buttons green, skin of fruit coarse texture. HS car fruit smaller. Practically no decay.

1 FB - Full-bunker iced.  
HS - Half-stage iced.

Table 3. (Cont'd).

Test	Service	Fans	Fruit showing			Remarks
			Decay	Pitting	Wilting	
			No.	%	No.	
19	FB HS	On "	0 0	0 0	0 0	Cars alike; test boxes & commercial loads, fresh, firm, bright, buttons green, Practically no decay.
20	FB HS	On "	0 0	0 0	0 0	Same as Test 19, except some green tinge in color and a few field scars.
21	FB HS	On "	0 0	0 0	0 0	Cars alike; test boxes & commercial loads, fresh, firm, bright, buttons green. Practically no decay.
22	FB HS	On "	0 0	0 0	0 0	ditto
23	FB HS	On "	1 S.end 0	.46 0	0 0	ditto
24	FB HS	On "	0 0	0 0	0 0	ditto
25	FB HS	On "	0 0	0 0	0 0	Same as Test 21, except size 200's and larger showed white powdery residue.
26	FB HS	On "	0 0	0 0	0 0	Same as Test 21.

FIG. 1

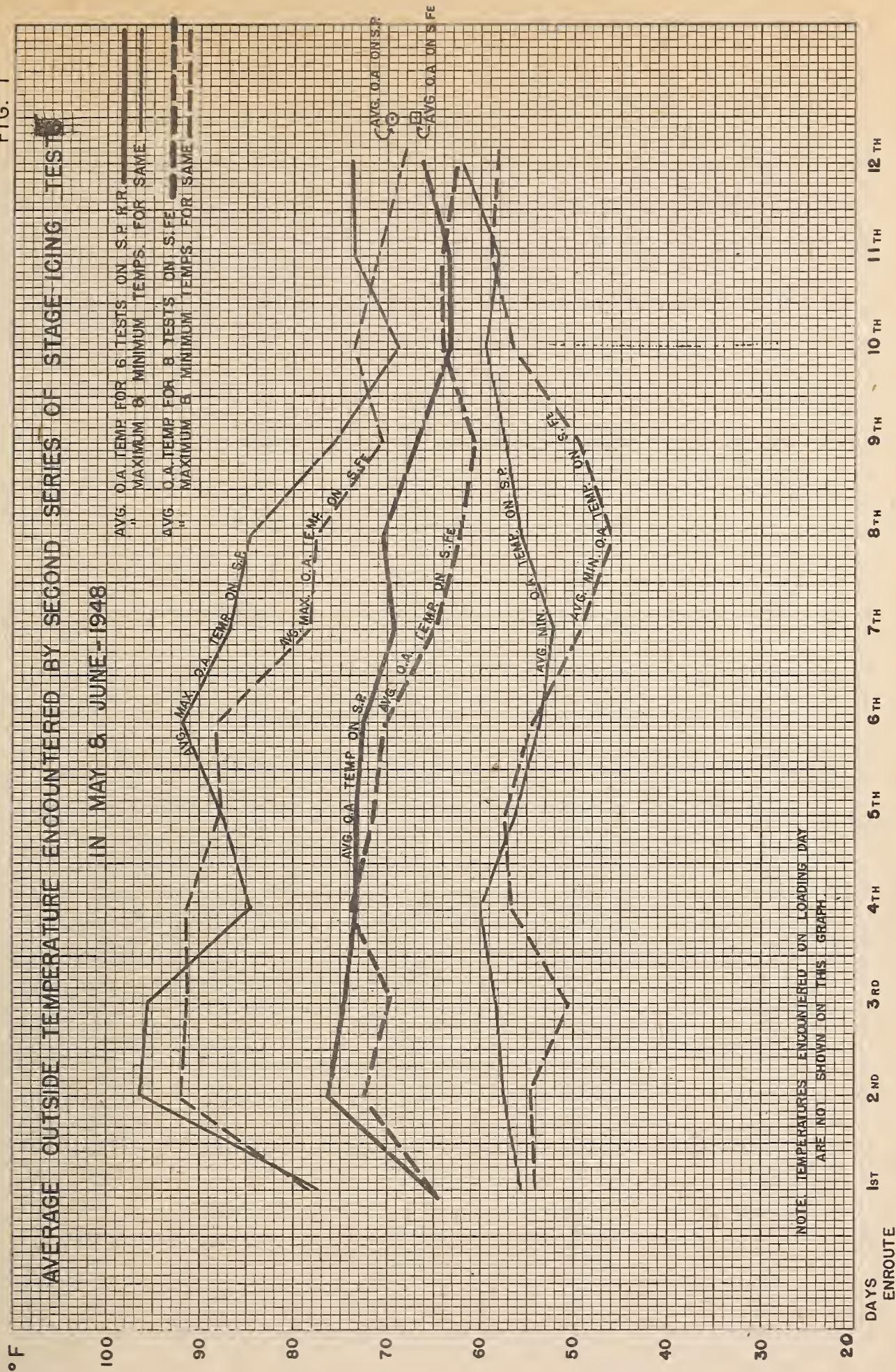




FIG. 2

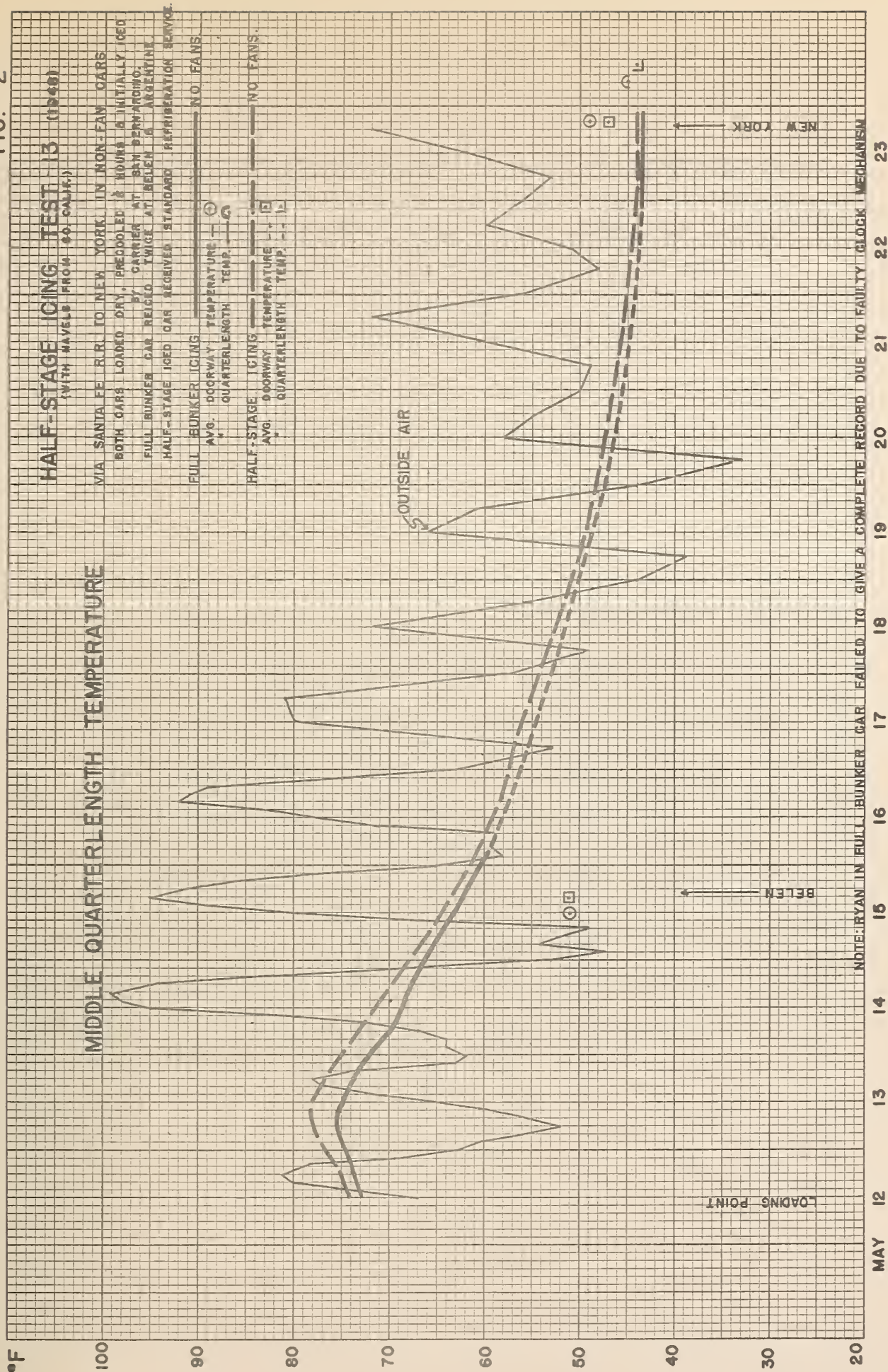




FIG 3

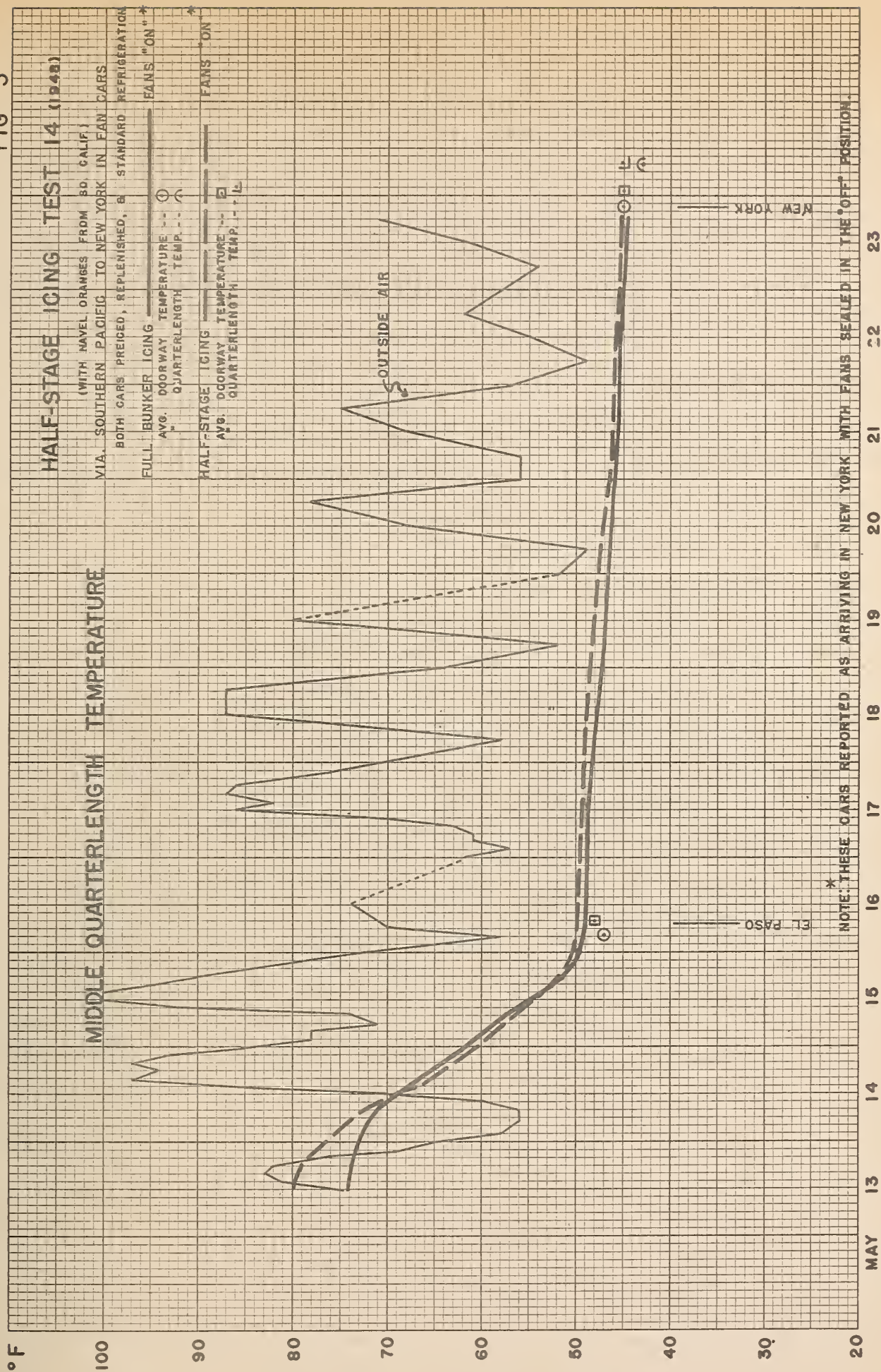




FIG. 4

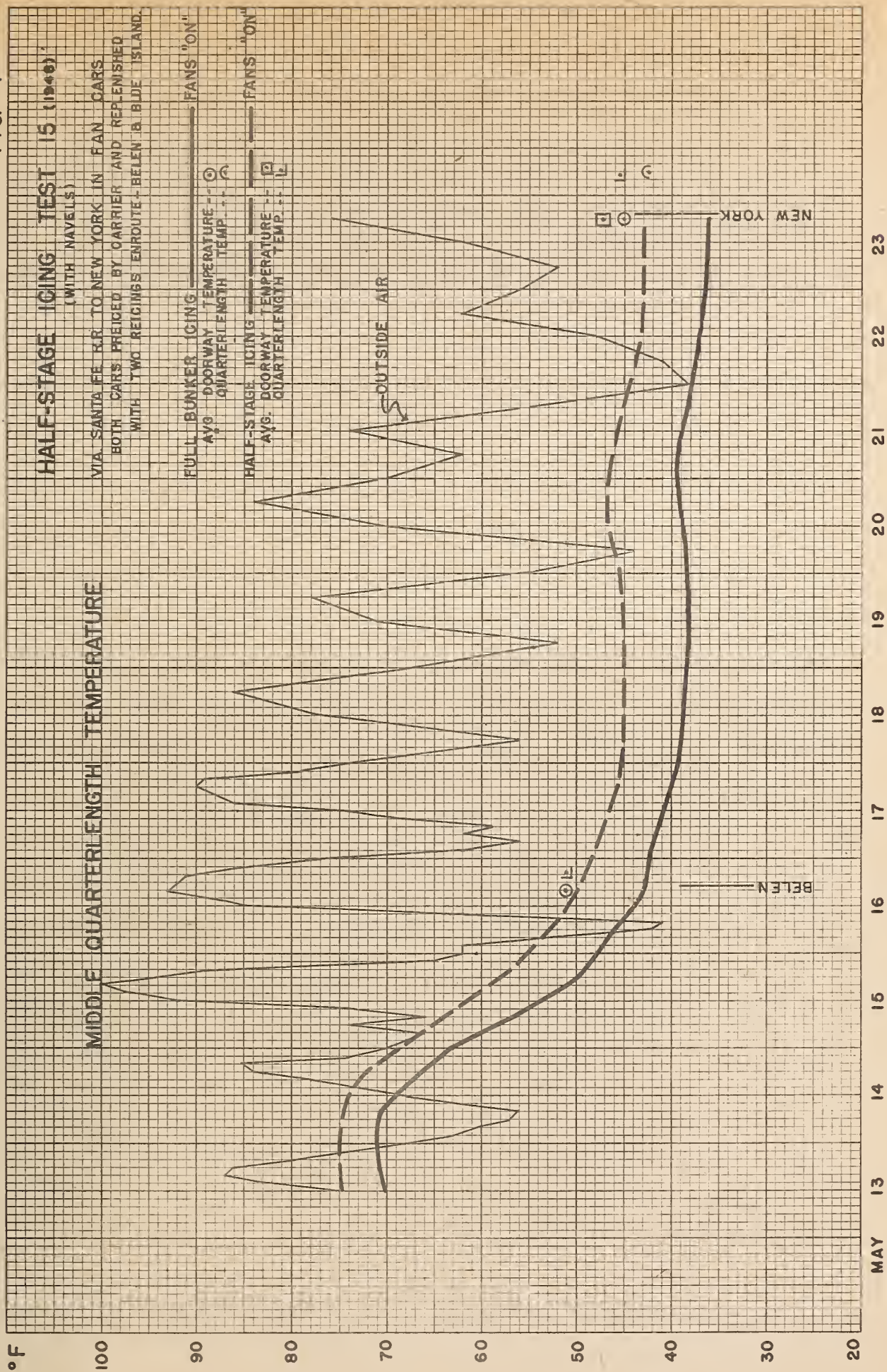




FIG. 5

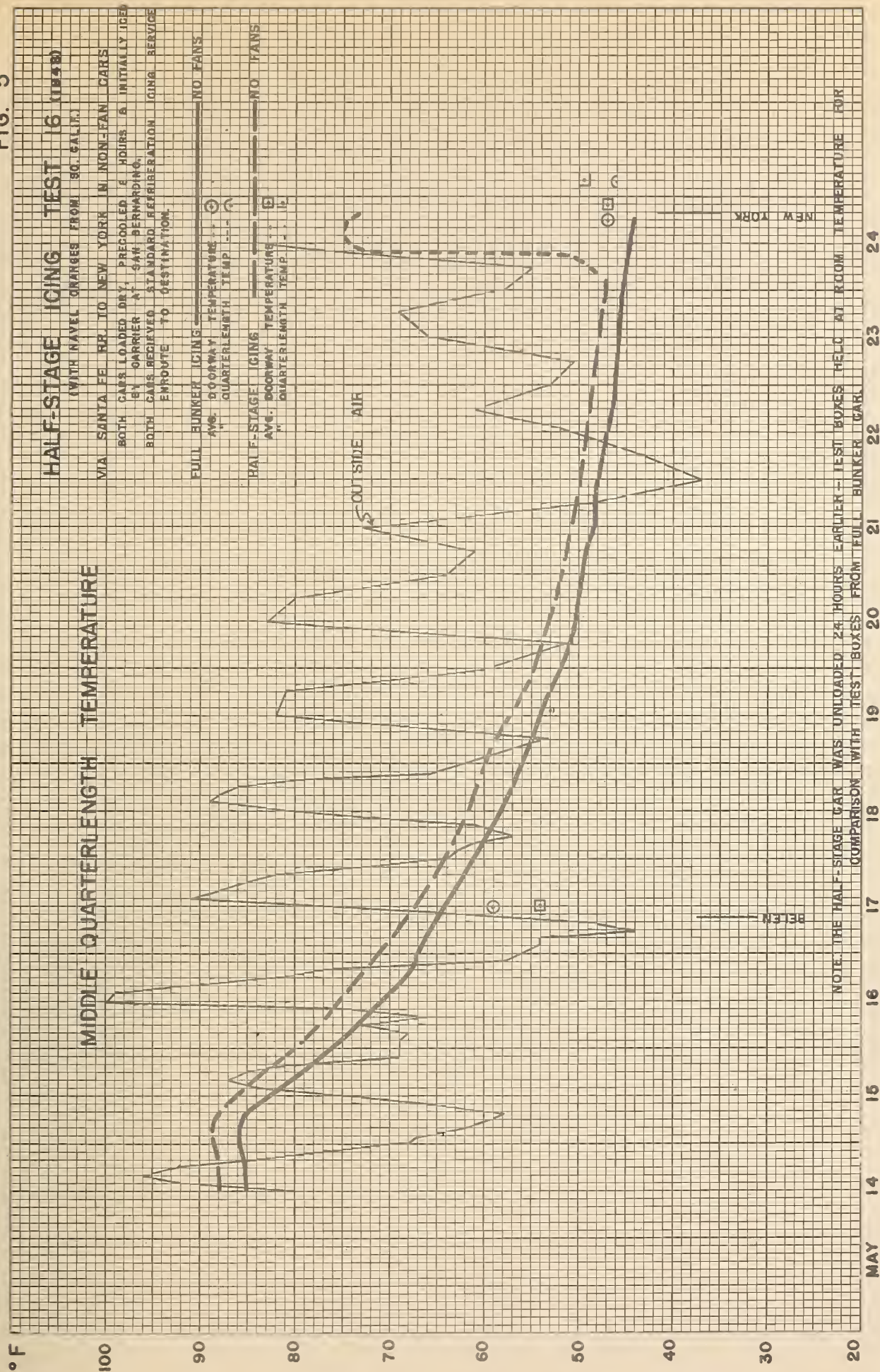




FIG. 6

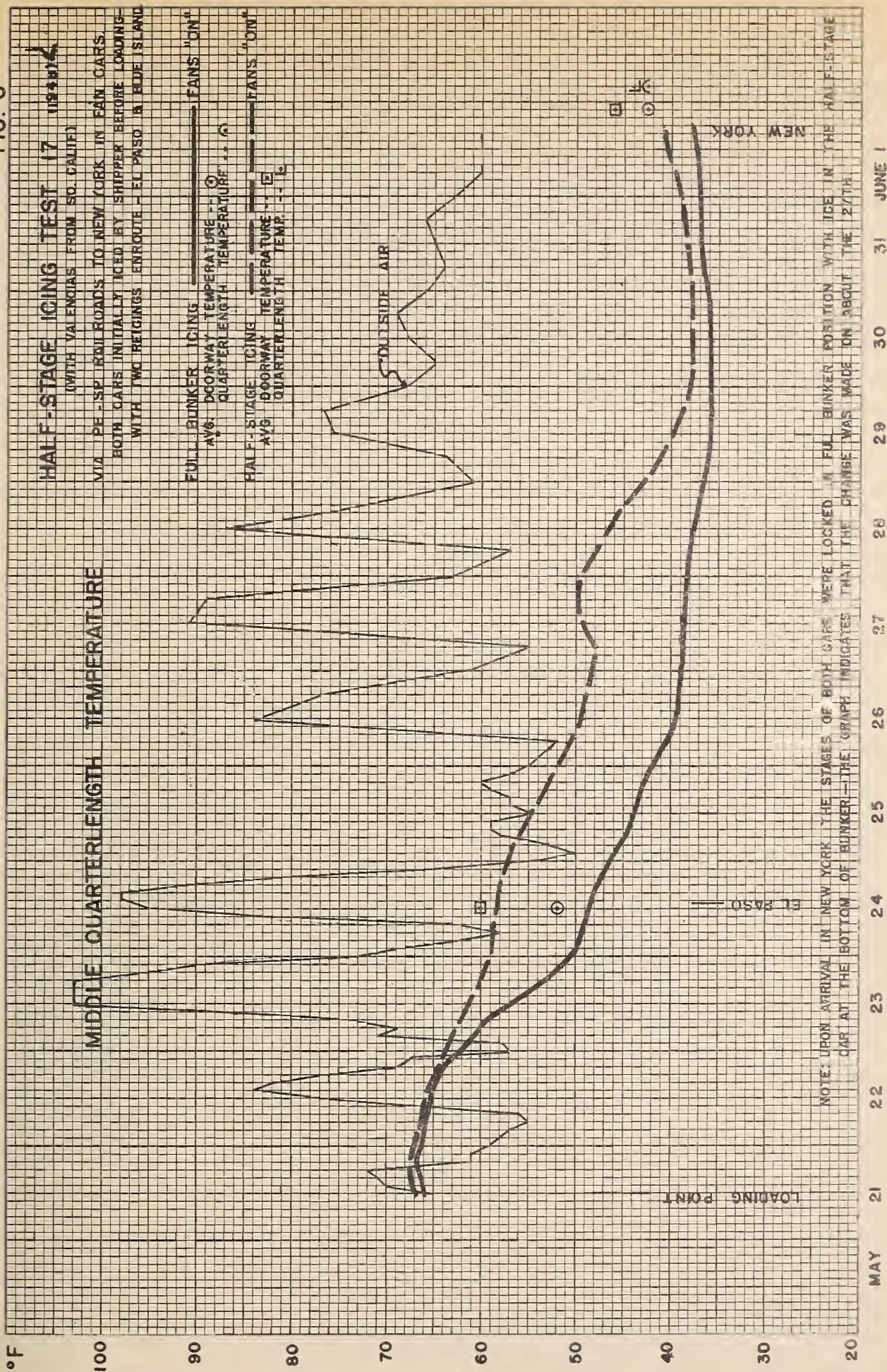




FIG. 7

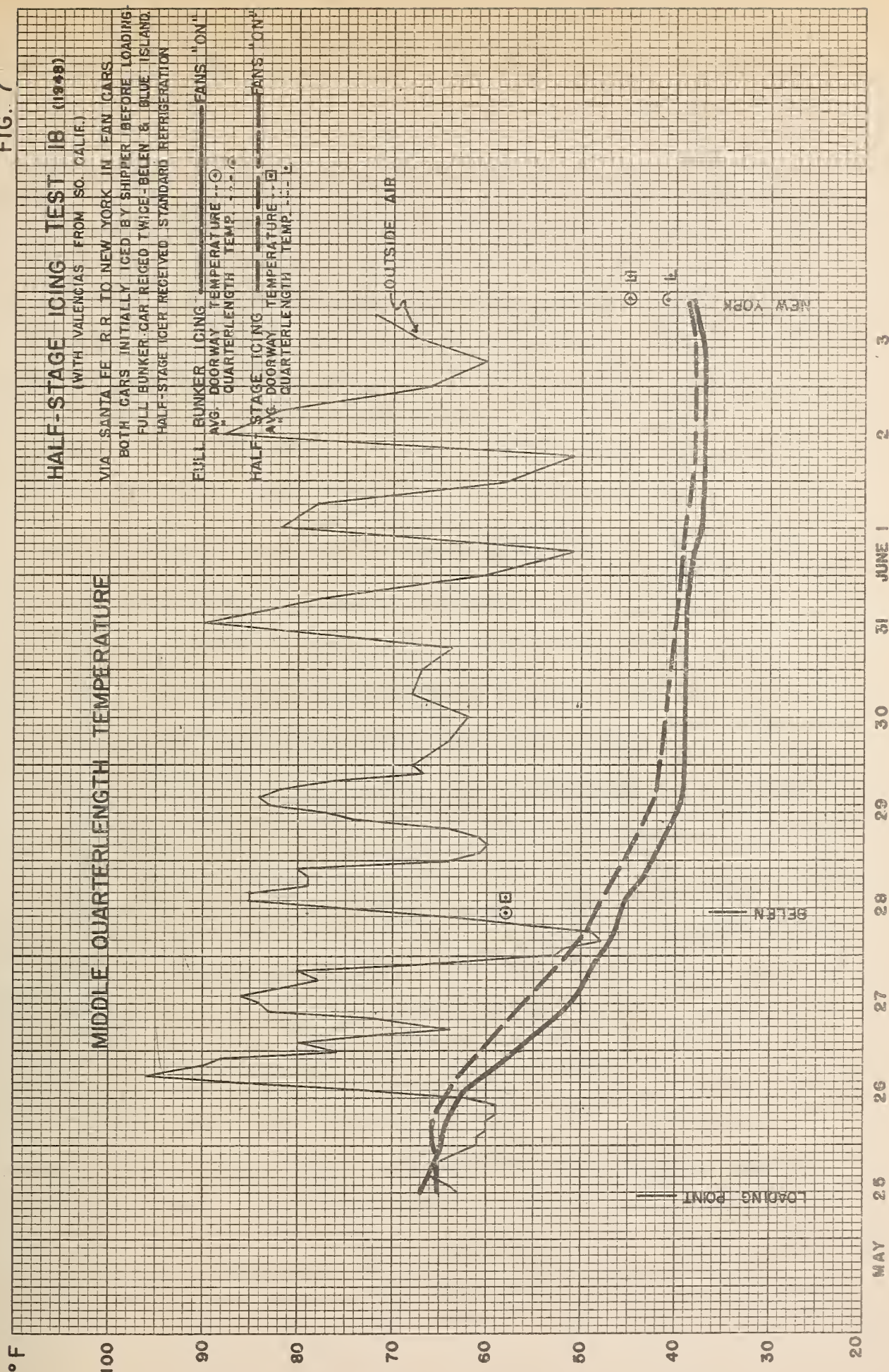




FIG. 8

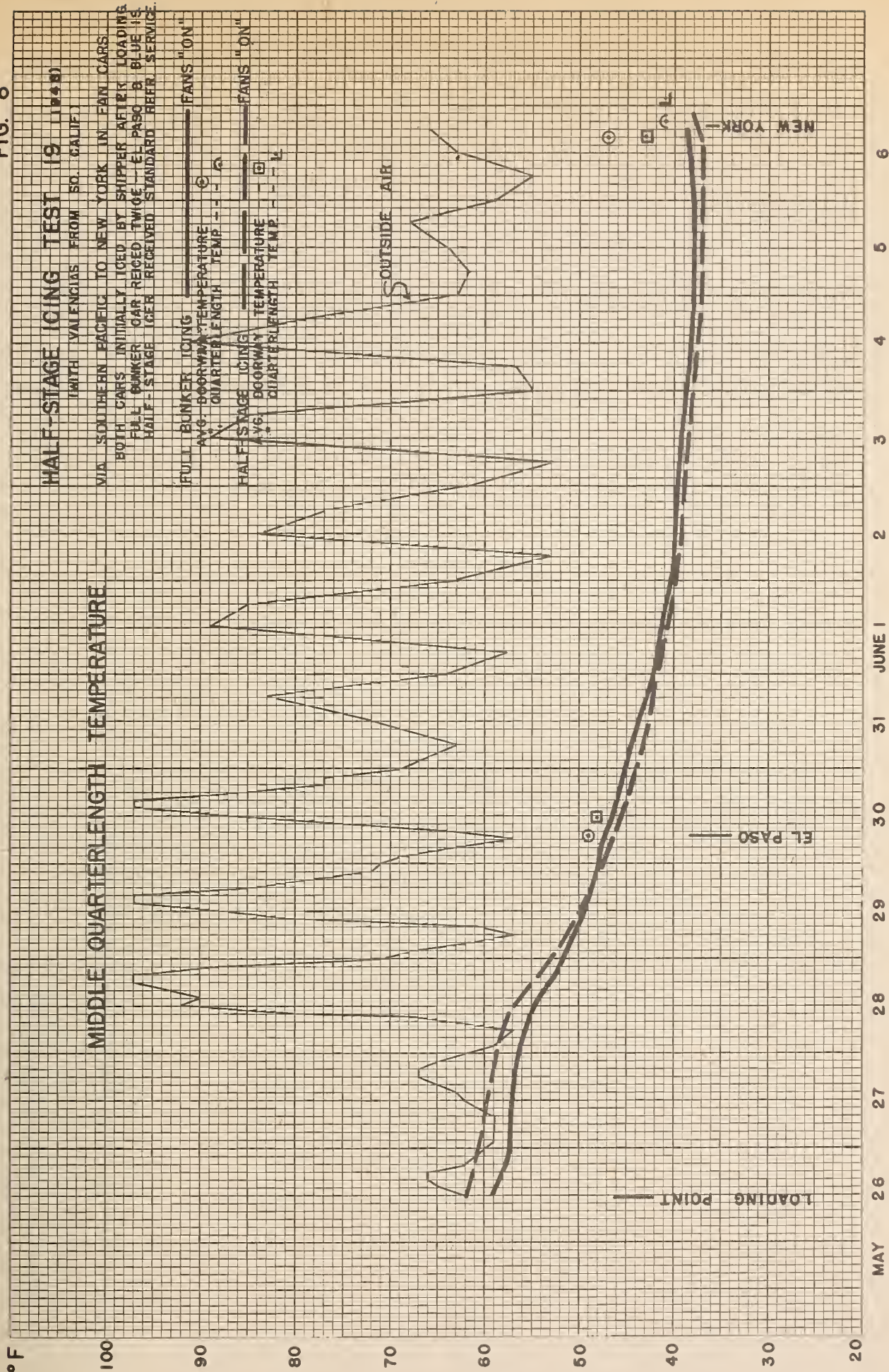




FIG. 9

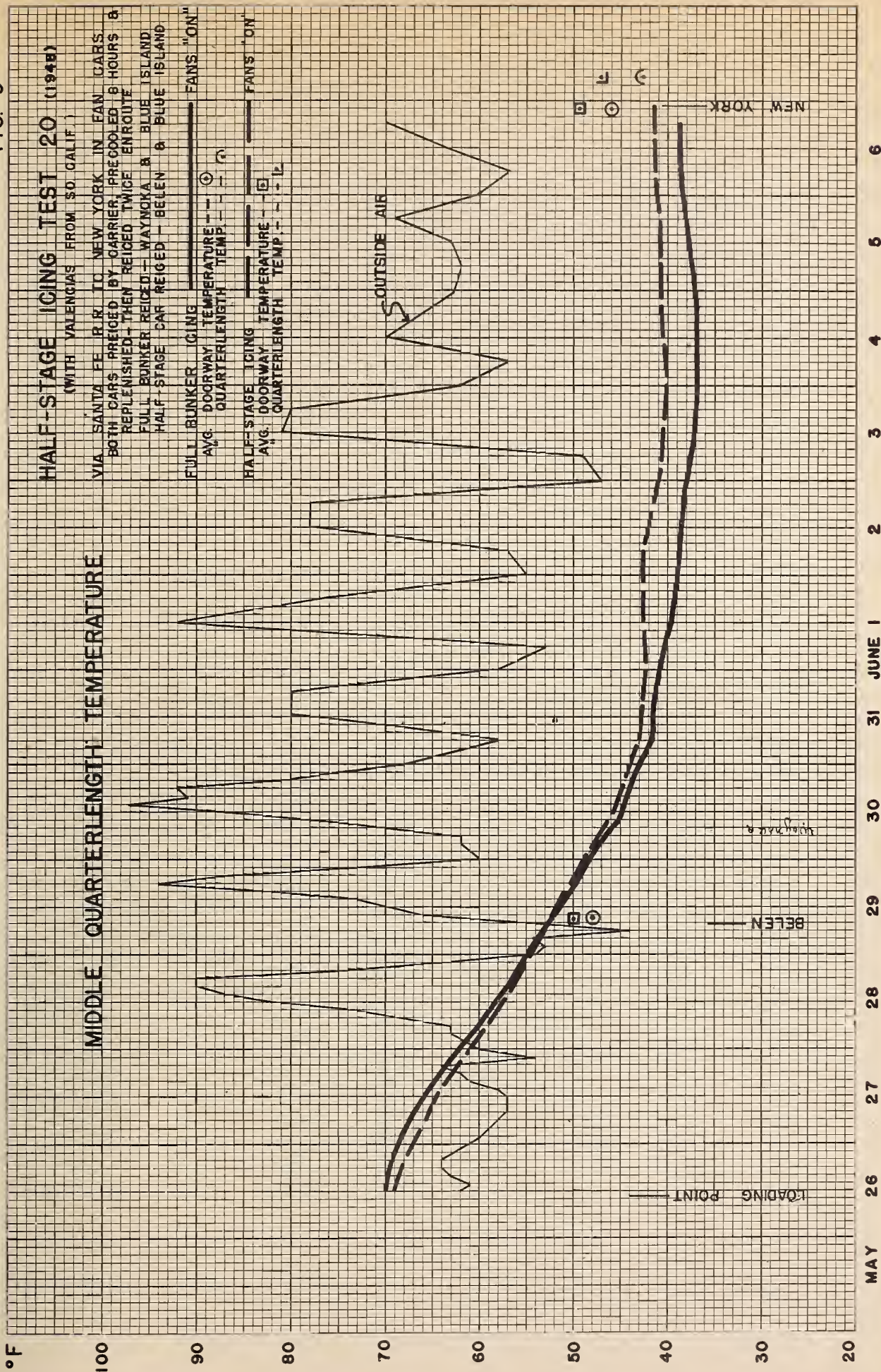
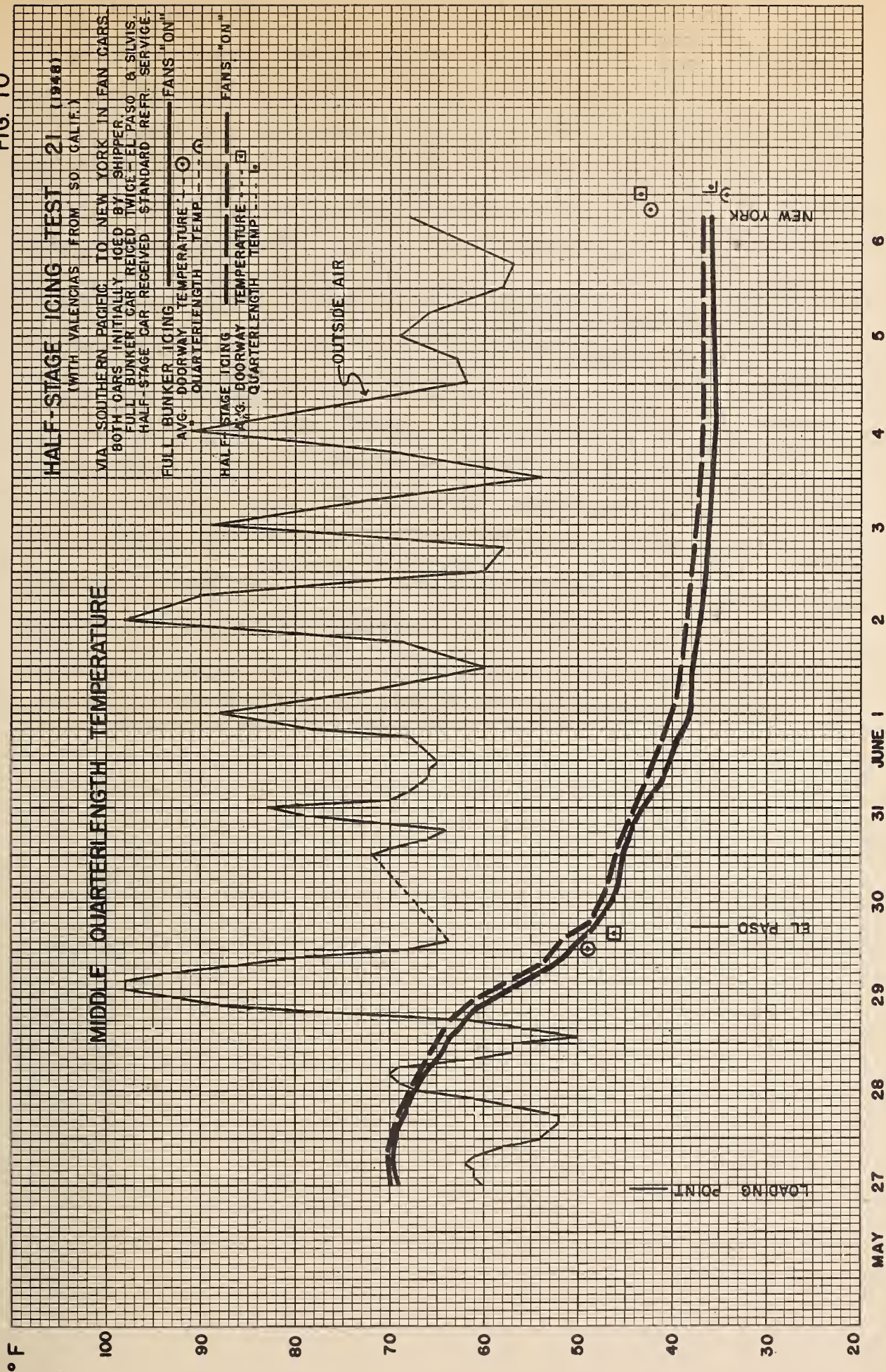




FIG. 10



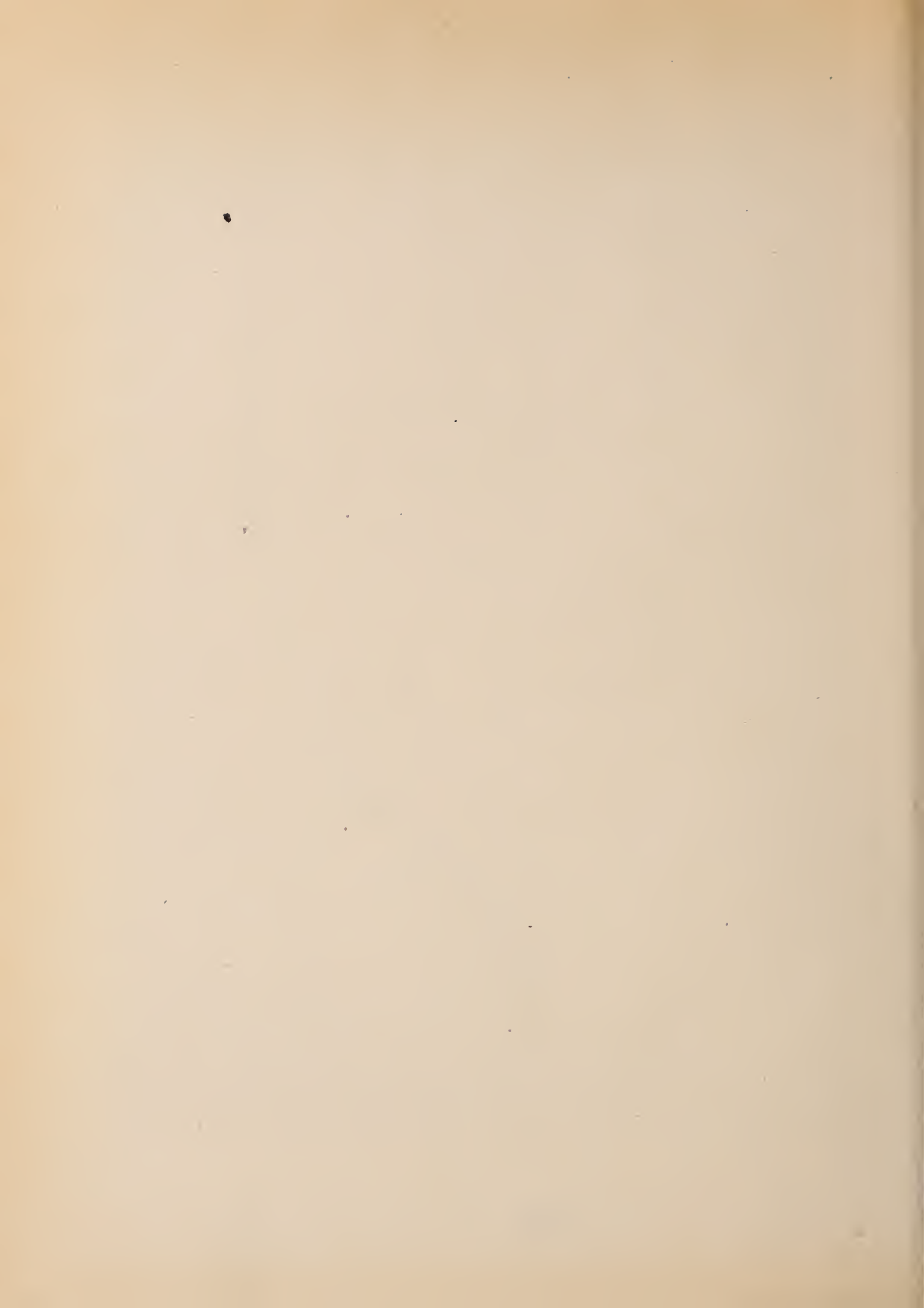


FIG. II

# HALF-STAGE ICING TEST 22 (1948)

WITH VALENCIAS FROM (SO. CALIF.)

## MIDDLE QUARTERLENGTH TEMPERATURE

VIA SANTA FE RR TO NEW YORK IN FAN CARS  
 BOTH CARS PRELOADED BY CARRIER, PRECOOLED 8 HOURS  
 B. REPLENISHED - BILLED TO REIDE ONCE - BELEN.  
 A SECOND REICING ORDERED FOR HALF-STAGE CAR  
 WAS RECEIVED AT BLUE ISLAND.

FULL BUNKER ICING  
 AVG. DOORWAY TEMPERATURE - - - - -  
 QUARTERLENGTH TEMP. - - - - -

HALF-STAGE ICING  
 AVG. DOORWAY TEMPERATURE - - - - -  
 QUARTERLENGTH TEMP. - - - - -

FANS "ON"

FANS "ON"

OUTSIDE AIR

BELEN

NEW YORK

NOTE: STAGES OF THE HALF-STAGE CAR REPORT AS FOLLOWS UPON ARRIVAL IN NEW YORK "A" END COMPLETELY COLLAPSED, "B" END  
 ONE-HALF COLLAPSED - ALL ICE WAS IN BOTTOM OF BUNKERS.

JUNE 1 2 3 4 5 6 7 8 9 10 11 12 13

°F

100

90

80

70

60

50

40

30

20

LOADING POINT





FIG. 12

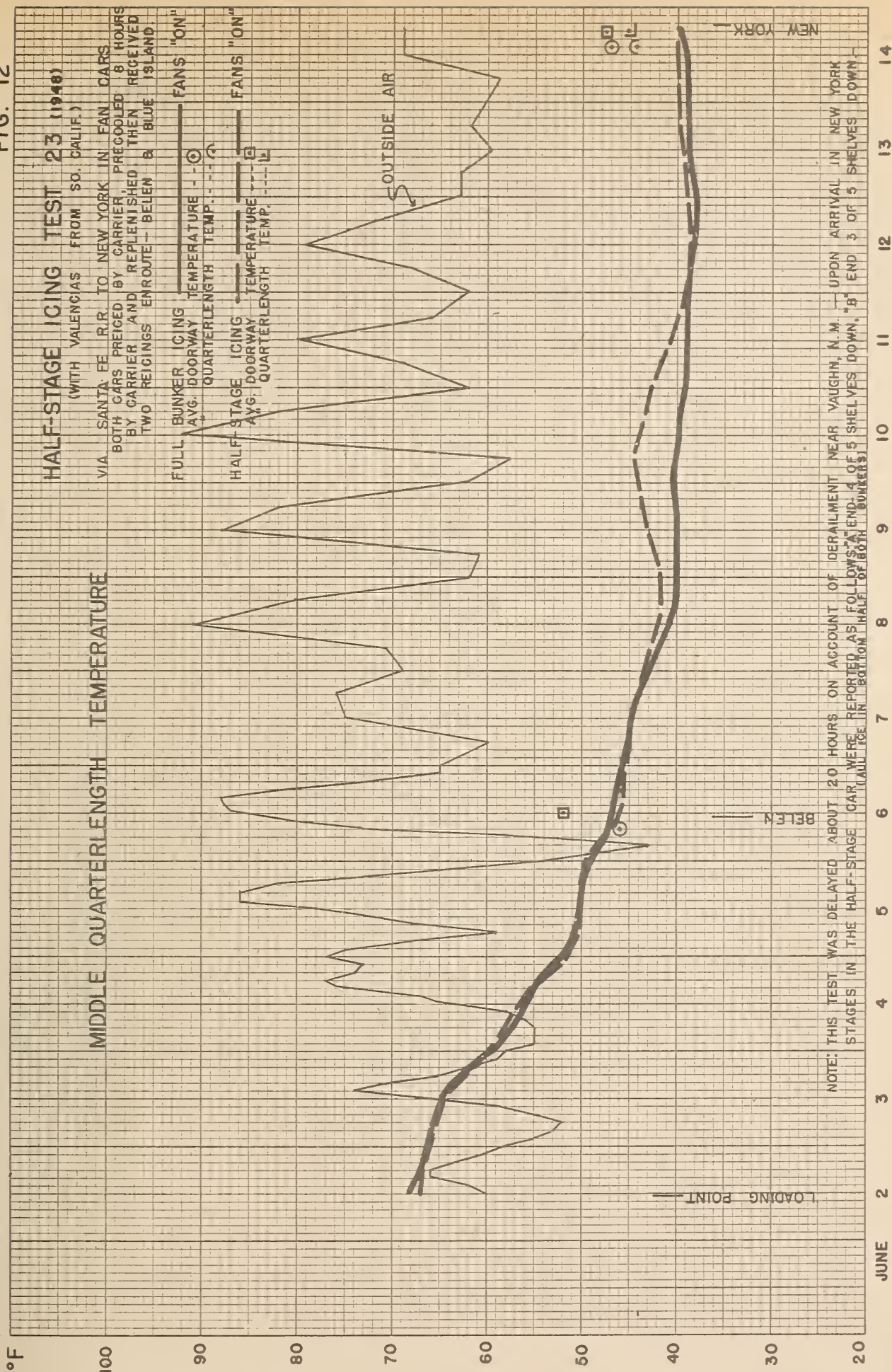




FIG. 13

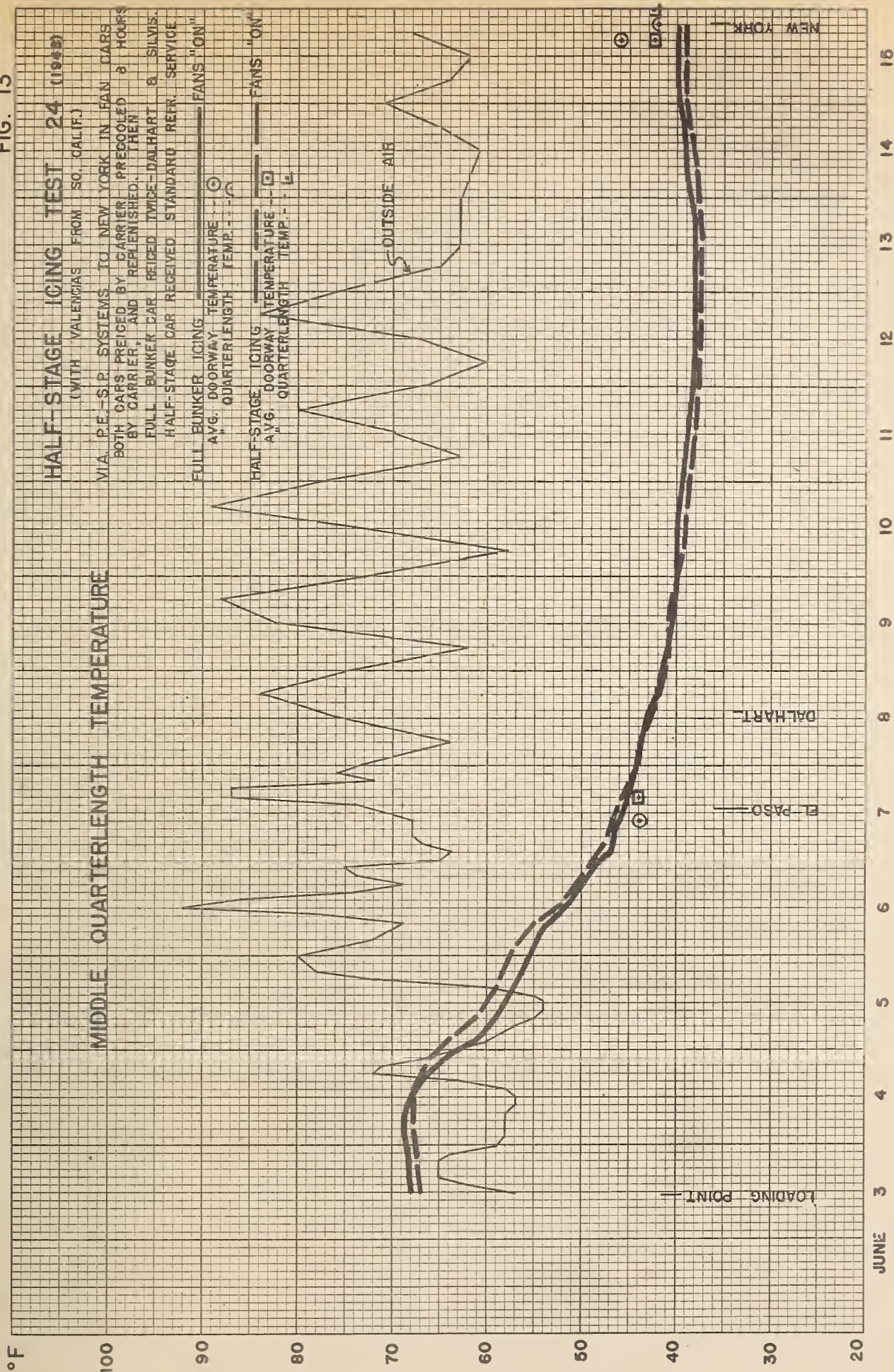




FIG. 14

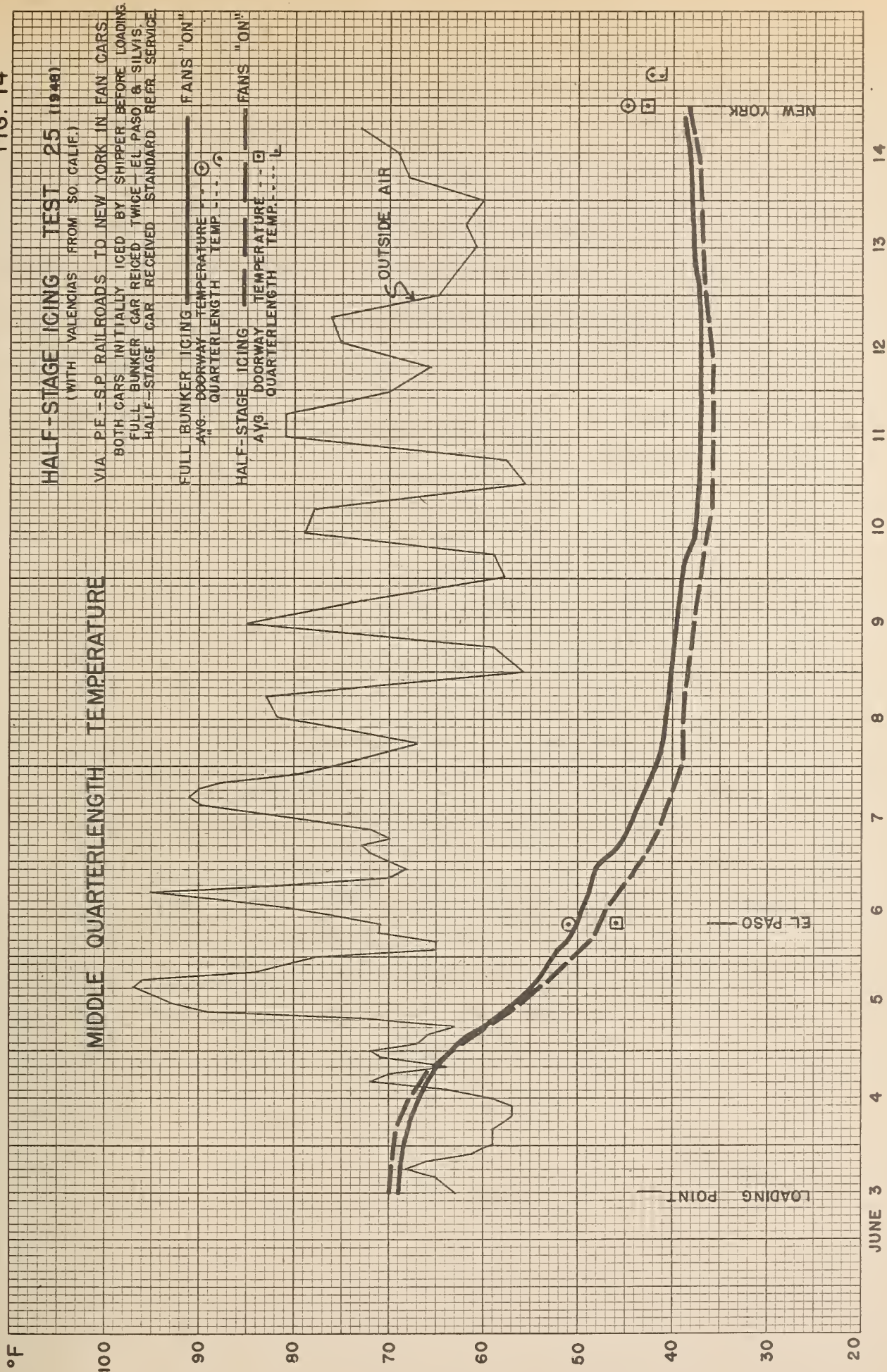




FIG. 15

